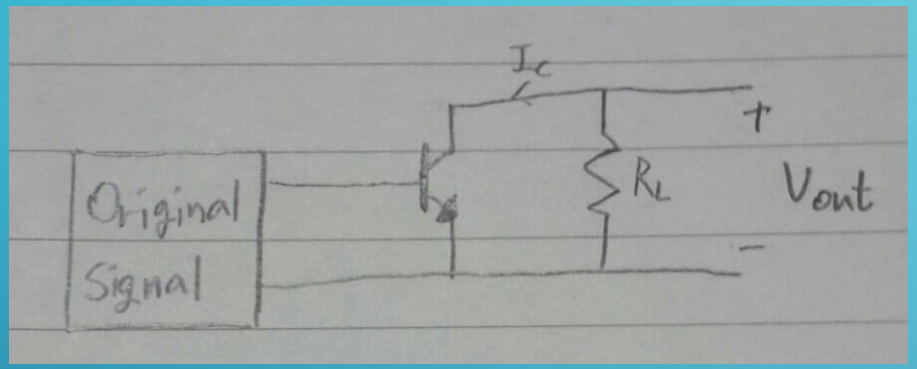
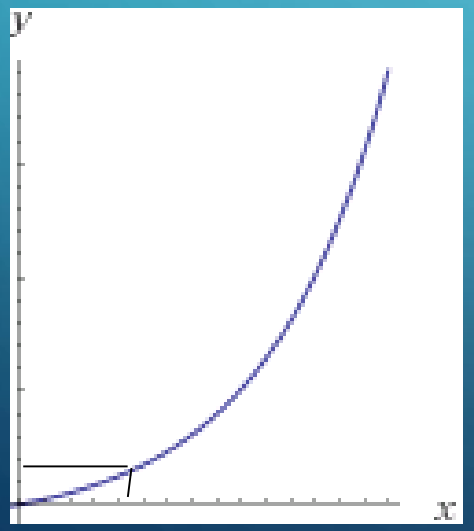
BIAS AND TRANSCONDUCTANCE

15.10.08 2014142052 석민호

SIMPLE AMPLIFIER



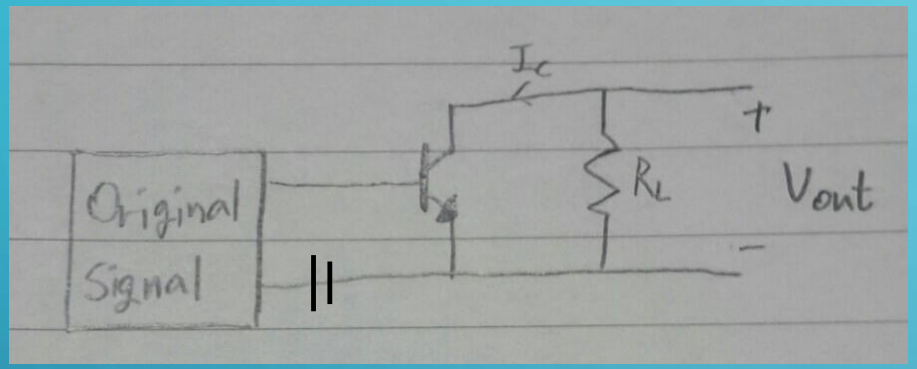


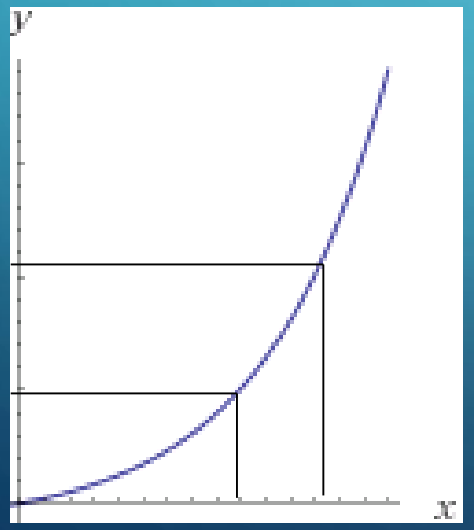
- $I_c = \frac{-V_{out}}{R_L}$
- $V_{out} = -R_L I_c$

$$= -R_L I_s \left\{ \exp\left(\frac{V_{BE}}{V_T}\right) - 1 \right\}$$

- V_{BE} moves 0~10mV, I_c moves 0~5 × 10^{-16}A
- if we want V_{out} to be 0~100mv, IMPOSSIBLY LARGE RESISTANCE is needed

BIASING





- Biasing
- Adding the battery 750mV, I_c moves 1.7mA => 128Ω R_L needed
- Operating point determines how transistor works

TRANSCONDUCTANCE

- Transconductance means how sensitively collector current moves
- $g_m = \frac{dI_c}{dV_{BE}} = \frac{d}{dV_{BE}}\left(I_S \exp\left(\frac{V_{BE}}{V_T}\right)\right)$

$$= \frac{I_S}{V_T}\exp\left(\frac{V_{BE}}{V_T}\right)$$

$$= \frac{I_c}{V_T}$$

- No bias means $g_m = 0$, no amplification. We need certain g_m
- Power consumption vs g_m
- "Small" means small fraction of V_T
- V_{CE} must be a constant